

SERICULTURE IN OUDH.

BY

DR. E. BONAVIA,

HONORARY SECRETARY, AGRICULTURAL SOCIETY
OF OUDH



BEING A CONTINUATION OF A SIMILAR PAMPHLET
PUBLISHED IN SEPTEMBER 1863



"Perseverance is the Mother of Success."



LUCKNOW

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HONORARY SECRETARY A. H. S. O.

Lucknow 1st May, 1864.

THE FOLLOWING ARE REPORTS TO THE CHIEF COMMISSIONER OF OUDH, ON GOVERNMENT SILKWORM EXPERIMENTS, PUBLISHED BY HIS KIND PERMISSION.

Memorandum of Silkworm experiments carried on at Fyzabad by
P. CARNEGIE, ESQUIRE.

1. SILK.—We commenced operations in the Jail in the cold season of 1862-63, with a few Cashmere eggs, received partly from Mr. Cope and partly from Mr. P. T. Carnegie. The result of that season's experiments was detailed in the last year's Administration Report. We succeeded in producing a fine specimen of Silk and a good supply of eggs.

2. CHINA WORMS.—On 21st July last, I obtained about 250 China Silkworm eggs from Dr. Bonavia, these at once hatched, and they went on spinning and multiplying for the five following months, having in that time produced nearly 2 lacs of Cocoons, weighing 700 Rupees, from which 27 tolahs of excellent silk, and 213½ tolahs of tussur was obtained, the rest being wastage.

3. These China worms then entirely died out, and the Jail people did not succeed in saving a single egg.

4. CASHMERE WORMS. From our last year's supply of eggs 16,215 fine Cocoons were spun between January and April of the present year, weighing 314½ tolabs. From 12,000 of these Cocoons we reeled off in the Jail 34 tolabs of beautiful silk, and had 90 tolabs of Tussur, the rest being wastage. Of the remaining 4,215 Cocoons 585 have been kept for the Lucknow Show, and from 3,630 we have obtained 28 tolabs of eggs for next year's operations.

5. From a pecuniary point of view it is scarcely encouraging to think that the market value of the silk produced @ 16 Rupees per lb. is Rs. 12-2-5.

6. Our extensive Mulberry plantation is progressing favorably in the Jail Garden, and for several weeks the worms were fed from it alone. An experiment was made of having a small plantation under the South wall of the Jail in the hope of forcing the foliage, but with no appreciable success.

7. A good many of the Talooqdars were induced to go and inspect the silk operations, and some of them have responded to our calls to plant out Mulberry trees, but none of them have taken any active part or interest in the experiment. I still however have hopes that the Mahomedan weaving population of Tanda, may some day take to silk culture, since Cotton is, to some extent, beyond their reach.

Memorandum of Silkworm experiments made under the directions of Captain E. Thompson, Deputy Commissioner of Seetapore.

A considerable quantity of silk has been spun during the year as will be seen from the return below. Owing to various causes the supply of eggs has been very small.

STATEMENT OF SILK SPUN.

DISTRICT.	1863-64.
Seetapore.	1st sort 20 lbs. 9 ozs. 2nd do. 20 „ 10 „
	Total 41 lbs. 3 „

The production of silk has extended but very little, and it cannot be expected that such will not be the case till time be allowed for cultivation of the mulberry tree. Though the Talooqdars are exhorted to plant out mulberries, they evince little interest in the matter. The care and feeding of the worms, and reeling silk has been taught to 6 men. One small zemindar, a mahomedan of Khyrabad, has received some worms, and showed me some very creditable Cocoons. This is the only instance I know of the culture having been taken up.

Memorandum of Silk worm experiments made under the direction of J. G. Anderson Esqr. Deputy Commissioner, Barwitch.

A good deal of attention has been paid to the rearing of silkworms. The Chinese monthly variety thrive very well all through the rains, but died off in the cold weather. There will always be a difficulty with this variety of silkworms. The cold in the winter is too severe for it, and during the winter, all the mulberries shed their leaves. Dr. Bonavia seems to be of opinion that the country Mulberry * keeps its leaves during the winter but I have not found it so.

The Cashmere worms thrive remarkably well, and I have obtained some very good silk from them. A few that were rather late of hatching were killed by the hot winds.

I think the Cashmere variety has the best chance of succeeding in this province.

The Talooqdars have not done much towards propagating the Mulberry, but as they have now seen the silkworm, and the silk produced by it, they are beginning to take an interest in it. There is a very large number of Mulberry plants now in the public garden, and during the rains I will be able to distribute a good many to each Talookdar.

* It is not the Country Mulberry, but the *Morus multicaulis* which produces leaves in winter. E. B.

Report on Silkworm Experiments made in Lucknow, and concluded in April 1864, under the Superintendence of Dr. E. Bonavia.

During the rainy season of 1863, the experiments with the China Silkworm alluded to in my first report were continued till the commencement of the cold weather, viz., during a part of June, July, August, and September. I was very successful in getting various crops, and the amount of silk produced up to that time was upwards of 22 lbs. The loss of worms was very small and such as may be always expected, as a portion of those that hatch last, are always more or less weak. But this small number was insignificant.

At that season, the China worm takes about 33 days from the time of hatching to the birth of the next generation, and that is the reason it is called monthly. During the above 4 months, with management, four broods can be obtained. The Cocoons of this worm are small but they reel very easily, and their thread is strong.

I continued breeding this worm also in October, but the crop of that month was not successful. A large proportion of the worms, when the spinning time arrived, became yellow and died. The Bengalee reeler said that the cause of the failure was the occasional cloudiness of the weather which occurred during the month of October, and that the same often happens in Bengal, for which reason breeders there at that period substitute to a great extent another variety, called "Choto Pooloo," which thrives better than any other during the month of October. On making further inquiries, I was informed that cloudy weather has some effect on the worms at particular seasons. I am rather inclined to think that it is the alternation of temperature, that is, warm days and cold nights, during the month of October, which interfere more or less with their physiology. It may also be very possible that the occasional cloudiness of the weather, producing electrical changes in the atmosphere, causes a corresponding nervous change to take place in the worms, by which their nutrition and consequently their health may be very much affected. It is in the experience of every one that on certain days one feels languid and listless, without being able to account for the cause of it. It is more than probable that in many cases, this languor depends on external electrical changes, influencing the electricity of the

nervous system, and probably, if this state were to last many days, it would materially affect our health. If it be considered that such a change, continuing for even one day, is a long a period in the life of a silkworm, one can easily comprehend how occasional cloudy days may affect the healthiness of the worms and consequently the quantity of silk they produce.

If the cloudiness of the weather were the true cause of the occasional failures of crops, the cause of successes during the rains (a very cloudy season) remains yet to be explained.

Be the cause what it may, it is a fact that sometimes in Bengal without one being able to account for it, and apparently under usual circumstances, a crop of silkworms entirely fails. If the bad system of rearing be adduced as the cause of such failure, I could not consider that sufficient; otherwise, how are the many good crops to be accounted for, the general system of rearing being the same in all crops. In my opinion there must be some concurrence of causes which are not sufficiently known, and the effects of which usually show themselves about the spinning time. This important subject has attracted the attention of philosophers, but as yet with no very satisfactory result; and certainly there is nothing more worthy of being encouraged by Government, than the study of the failures of silkworm crops. The more men there are who are willing to devote their attention to this important subject, the better.

During the cold months of November, December, and January, I found it impossible to rear either the China worm, or the "Choto Pooloo," both of which produce several crops in the year. I have little doubt that with care a small number of worms might be reared in a warm place for the purpose of continuing the breed for seed, but I don't think that there is any great object in doing so, because it is not difficult to obtain eggs of the China worm from Bengal every year about June. If not obtainable in large quantities, small quantities will do, as in about 3 weeks after they hatch, a sufficiency of eggs will be obtained for a large crop.

The eggs of the Cashmere stock which I kept from 1863 were completely spoilt. They were kept in different ways but closed up in bottles which appears to be a bad way of keeping them. They fermented and became mouldy. A very small quantity which was left in the bottom of a

open bottle uncared for, did not spoil, and I was glad to discover one day when the proper season returned, that the young worms had hatched and were creeping up the side of the bottle. The Cocoons produced by this small number of acclimatized worms were not inferior to the average produce of those procured from Mr. Cope in 1864. It is evident by this accidental little success that there is a way of keeping the eggs of the Cashmere worm throughout the year in Lucknow, if it be only studied a little.

For the cold season of 1864, I procured various kinds of eggs to experiment with :

1st I received a considerable number of eggs of the "Boro Pooloo" Silkworm of Bengal. It was the first of all other kinds to hatch, and the whole of the worms came out in two days. This is of considerable importance, as then they all have the advantage of the cold days of the winter to grow in. They all lived and produced good Cocoons which reeled very well. I kept some for eggs for next year in order to ascertain if they produce as good Cocoons as those which are freshly imported from Bengal.

This worm is an annual, but the eggs obtained from the above brood, having been kept in a warm place, began to hatch a second time at the beginning of April. Their further hatching was stopped by being placed in a cool locality as there could be little advantage in rearing them under difficulties during the months of April and May.

The "Boro Pooloo" is a very good sort of a worm. Although small, its Cocoon is firm, full of silk, and its thread is strong. Those that I reared had among them a good proportion of the dark colored variety. I cannot find any reason to believe that this worm belongs to a different stock from the Cashmere and Bokhara worms. If it does not, it has naturally selected and adapted itself to the climate and other conditions of Bengal, and has become a distinct variety. Its Cocoons are for the most part of a perfect white, but many of them are yellow, and some are white with a greenish yellow tinge. I have crossed it with the Cashmere and Bokhara worm, to see what sort of an animal it will produce.

If I were rearing silkworms for commercial purposes in Oudh, I should certainly prefer, for the winter crop, the "Boro Pooloo" to either the Cashmere or Bokhara worm.

2nd. Mr. Scarlett of Peshawur furnished me with 30 tolas of eggs of the Bokhara silkworm, at the rate of five annas per tola. The eggs of this worm are loose like those of the Cashmere breed. They began to hatch towards the end of February last, and continued to do so in large numbers every day till about the middle of March. The worms resulting from them appeared very healthy, and had a large proportion of the dark colored variety among them. The first cocoons were firm, large, and full of silk. After the beginning of April, although the worms continued to feed, all those that were ready to spin, would not do so. They wandered about and then stood still and died. They appeared to be full of silk, but could not give it out. Very few of them turned yellow. I think their not spinning can be safely attributed to the sudden heat which came on after the beginning of April. I shall try them again next year, using, if possible, artificial means to make them hatch a fortnight or three weeks earlier. I am not sure that this is an easy matter, because Captain White, Superintendent of Police at Bijnore, who takes great interest in silkworm rearing, has informed me that he tried to get the Cashmere eggs to hatch early, but could not succeed. If this can be effected, I think the Bokhara worm will do, otherwise, as yet I cannot recommend it for Oudh, as the heat, coming almost suddenly after the cold nights, interferes too much with its health. However many more experiments are required to be made before the right way of treating silkworms out of their own climate is learnt, and unless one can devote a great deal of time to these investigations, little will be learnt. Although all the silkworm arrangements were under the superintendence of the Bengalee reeler, he was quite ignorant of the proper treatment of the Bokhara and Cashmere worms, and he honestly said that he could not give any hints, because he knew nothing at all about them. The number of cocoons that resulted from the Bokhara worms was small, and they did not reel very easily. The thread was weak.

3rd.—This year I procured a pound of eggs from Mr. Cope, for which he charged Rs. 48, that is, at the rate of Rs. 3 per ounce. They did not appear so good as those which he supplied the previous year. Many of them were light colored; the latter did not hatch. Those that were good began to hatch about the 3rd week in February, a large proportion of them, when the spinning time was approaching, turned yellow and died. It is difficult to say with any approach to exactness what the real cause of this was. It

may have been indifferent quality of eggs ; it may have been the heat ; or it may have been the difficulties under which I was placed with regard to feeding a large number of worms, with no regular plantation of mulberry trees. Last year, it is true, I had a smaller number of Cashmere worms, but none of them turned yellow, and they were exposed to greater heat than they were this year. Although they produced smallish cocoons, still they *all* spun, and their cocoons reeled much better, than those of this year. A small number that hatched first and that spun about the 3rd week in March, this year produced very good cocoons and their moths laid eggs, which, contrary to custom adhered firmly to the cloth on which they were laid. This is very unusual with Cashmere eggs, and can only be explained, I think, according to Captain Hutton's views, that is—the healthiness of the worm from being reared in a cold climate—the first ones that hatched having had the advantage of the colder part of their season. Some of these eggs attempted to hatch a second time, but I stopped this process by placing them in a cool place.

All the cocoons resulting from the Cashmere worms, excepting the very first ones, were indifferent and behaved very badly in reeling, that is, after a portion of the silk was reeled, they became open at one end, after which it was next to impossible to continue reeling them, as the thread got often entangled and continually broke. The reelers stated that the thread of each cocoon was particularly weak this year. When the cocoon does not reel easily, there is a great deal of waste, in proportion to the clean silk, and although the cocoons are large, they don't produce proportionately more good silk than the cocoons of the " Boro Pooloo, which are much smaller."

The foregoing account of the Cashmere worm does not seem very favorable; but the following report on a sample of silk which I sent to Calcutta after last year's experiment, contrasts very strongly with the above and is very encouraging. The samples of the Cashmere cocoons which I sent to the Calcutta exhibition and which were kept from my first experiment with that kind in 1863, gained the 1st prize, another sample of the same kind reared by a villager in Dharmpoor, Gonda, got the 2nd prize. It is possible that there were no other specimens of the Cashmere kind exhibited than the above,

still it shows that the judges considered them better than the Bengal varieties.

*Extract from Proceedings of the Agri-Horticultural Society of India,
19th August 1863, regarding the first sample of silk I sent to
Calcutta, reeled by natives of Oudh after a short teaching.*

" Read the following report on a sample of silk from Lucknow presented by Dr. Bonavia :—

" I have examined one of the skeins, it is reeled wonderfully well, considering that the reelers had only a week's training, but is endy, very foul, and knibby, which reduces its value very much. Present value Rs. 15 per Factory seer. The same cocoons, if well reeled, would yield silk worth Rupees 18, if otherwise well got up, free from ends and clean."

(Signed) W. G. ROSE.

" I have examined the two skeins and taken three reelings from one skein with the following result :

					Deniers.
1st,	400 yds.	...	4 breaks,	...	4 ends, ... 17
2nd,	Do.	...	none,	...	1 end, ... 18
3rd,	Do.	...	none,	...	none, ... 23

The silk is rather uneven and knibby, but well twisted and crossed on the reel. The quality is excellent, and superior in fibre to what we have in Bengal. In this respect, it is not unlike the Japan silk, and with equal care in the reeling, would be equal to that in value. I value these two skeins at Rs. 16 per seer."

(Signed,) E. PRESTWITCH.

" If these Oudh spinners, after a week's training are able to reel such silk as this, they will soon cut out Bengal. In all essential qualities, the silk is very superior and is worth Rs. 15 per seer."

(Signed) W. ANDERSON.

4th. Captain Hutton favored me with a small quantity of eggs of his selected dark colored worms. According to his views the dark colored variety approaches more to the wild kind and therefore has more-healthy blood in it than the white variety, which he considers ■ a degeneration of the original worm. It is strange tho' that the "Boro Pooloo" which has been reared in Bengal for ■ long time contains ■ large number of the dark colored variety. One would be inclined to think that considering the bad mode of rearing and the climate of Bengal, it would have degenerated into the white variety by this time, according to Captain Hutton's theory.

The selected dark colored worm of Mussoorie did very well, but I could not detect any difference between the Cocoons of these and those of the white Cashmere ones. I selected many of the black ones of the Cashmere, Bokhara, and "Boro Pooloo," and kept them separate, but did not find that they produced better Cocoons than the rest, and they all had one disadvantage, that is, on account of their color, it was not easy to discover when they were ready to spin. If they were then not separated from the others they crept among the leaves and produced irregular Cocoons.

5th. I procured a small quantity of Silkworm eggs from Marseilles, which reached me safely. They were brought out in October, overland, by Mr. Macbay, a relation of mine, who kept them in paper parcels enclosed in a card board box, and this again shut up in a tin case.

During the first half of the voyage they were in the hold, shut up in a trunk, and during the other half of the voyage they were in ■ cabin, the floor of which was always hot from being just above the boilers, still they did not hatch on the way. They reached me about the 30th November and began to hatch in small numbers about the end of February. They did not appear very healthy and produced small Cocoons. I have entered into so many details, regarding this little packet of French silkworm eggs for the following reason :—

Dr. Forbes Watson of the India Museum, London, advised me of the despatch from Marseilles on the 6th January last, the weather being then very cold, of ■ parcel of silkworm eggs from Lyons. They were sent overland in charge of a friend of his who ■■ going to Bombay, whence they

were to be forwarded to me, with instructions to shake them in the box once ■ day, as if left untouched in ■ mass for any length of time they were liable to ferment.* These eggs never reached me. Afterwards I heard from Dr. Forbes Watson that his friend informed him that all the eggs had hatched while the Steamer ■ in the Red Sea. Dr. Watson intends to try the experiment again of sending me out some European eggs. He says that Lyons is principally supplied from the Caucasus.

I again tried this year to place a number of worms on trees in the open air, and sheltered from the wind. Most of them were doing well and growing, but after some days they all disappeared. It is very difficult to keep small birds from trees, especially those which are in the habit of feeding on insects. Their discovering one worm would induce them to search for more, and they would be sure to devour them all. If I have sufficient leisure next year, I shall modify this experiment in the following way :—I shall plant in pots ■ number of young mulberry trees, ■ portion to be kept in the open air, while another portion is kept within doors to feed worms upon. The windows of the place to have ■ wire grating to keep out birds &c. The pots to be placed in pans containing water to keep away the ants, and the place where they are kept must have sufficient light to keep the plants in health. When the worms shall have devoured the leaves on one set of plants, ■ new batch is to be brought from the outside, the worms placed upon them, and the old plants to be taken into the open air again to recover their leaves and strength. Some such method may be devised for the purpose of having ■ set of healthy worms for reinvigorating the broods.

The silk resulting from the experiments of 1863, amounted to 10 seers *nawabee* weight, that is of 92 tolas ; of which ■ small proportion was Cashmere and all the rest China. Besides the above amount, various samples were sent to competent judges in Calcutta from time to time, in order to ascertain to what stage of efficiency the reelers had reached, but the answers I have hitherto received are, that the thread is too uneven yet and not

* This is the ■ for which my acclimatized Cashmere eggs were spoilt.

clean, and that the reelers attempt too much at a time. In order to produce an even and clean thread the cocoons should be reeled slowly.

I also forwarded some of my samples, together with various samples from Seetapore to Dr. Forbes Watson of the India Museum, to ascertain if that quality of silk is saleable in the English market, and what price it would fetch. Of these I have had no report yet. A further quantity of silk was made during the cold season of 1864, principally of the "Boro Pooloo" kind and small quantities of the Cashmere and Bokhara kinds in all 5 ~~seers~~ *nawabee* weight.

The total result of the year's experiments has been 15 ~~seers~~ of silk, *nawabee* weight, that is upwards of 34lbs. which has been sold in Lucknow at Rs. 16 per seer.

8 seers of "chussum" sold at Rs. 1 per seer, 1 seer of hand spun silk from cut cocoons sold for Rs. 6.

With regard to last year's silk, the natives in the Bazar said that the quality of the silk was by far too good for their work and the thread was too fine. This year I got it reeled thicker. They said it was very good but did not give any higher price than they gave for last year's produce. The Lucknow silk workers have been accustomed to a rough quality of silk. It suits their purposes, and they don't much care to give a higher price for a better quality. So that there is, at present, no inducement for the production of a good quality of silk.

If Sericulture is undertaken largely in Oudh, the best plan is to get the silk reeled well, and sent to the English market. The difference of price will more than repay the extra labor of reeling it well, and the carriage to England. I had a large quantity of the Cashmere and Bokhara kinds this year, but as soon as the hot weather commenced, those that had not already spun, became quite useless and were thrown away. This may be attributed to heat, and may also be attributed to imperfect means of feeding the worms, I mean, with regard to mulberry plantations. My experiments were made under difficulties, as the number of trees near my rearing house is small and the plants generally young. I was obliged often to send men as far as "Aishbagh" for leaves, a distance of 3 or 4 miles and most of the trees which I used in the vicinity of the rearing house were scattered. This

want of proper ~~man~~ entails more labor, and consequently requires more men to do that amount of work which, with concentrated trees on a regular plantation, could be done by a much smaller number of men. The breeding house ought to be as near as possible to the middle of the plantation. Every arrangement that saves time and labor is gain. Large and lofty mulberry trees, although apparently they contain plenty of food, are not the most useful kind. Low and wide spreading are the best, because the leaf gatherers are able to walk round the trees, and use both their hands to pluck leaves, while if the trees are large, the natives not only dislike to climb upon them, but when they do climb, they are obliged to make use of their hands to hold on; besides, the leaves of many small branches they cannot reach, which for all feeding purposes are entirely lost.

Many persons who have had some experience in silkworm rearing, say that the system of breeding is bad, that the leaves ought to be given fresh and fresh, and dry leaves ought to be cleared away often. This is undoubtedly good advice, but few have told us how this could be effected. We know very well that having a few hundred worms, they can be easily looked after, and all these luxuries afforded them, but if you have lacs and lacs of worms, all this good advice is thrown away, unless some method be devised, by which all the extra work entailed by often changing &c., might be either avoided or facilitated. It is of little use to tell us that the worm, in its natural state, has fresh leaves whenever it wants them, and is surrounded continually by fresh air. But the worm in its natural state does not supply thousands of people with silk dresses. Its natural state is incompatible with the numbers which are required for commercial purposes.

In my experiment with Cashmere worms in the winter of 1863, I had a small number of worms (15½ lbs of dry cocoons was the whole produce) and a proportionately large number of ~~men~~ to take care of them. I then made the men, in clearing the dry leaves, take up the leaves one by one with the worms adhering to them. Of course this answered very well, and all the worms were quite healthy; but this method could not be adopted with a large number of worms, and the following was the mode practised this year under instructions of the Bengalee teacher. Large trays were made, Bengal fashion, of strips of Bamboos, woven into mats. All round the edge a rim of reeds

(Senthà) bound together was made which served the purpose of preventing the leaves and worms from falling off. On the under side of the tray thin bamboos were tied to make the whole firm. About 10 or 12 of these trays are supported each on horizontal bamboos tied to 4 upright posts driven into the ground, and the whole arranged in such a way that each tray can be pulled out like a drawer, and put in again after the worms are fed. The distance between the trays is about six inches, the length and breadth of each tray being 8 feet \times 5 feet. At the bottom of each of the 4 posts is an earthen pan with a hole in the centre for the post to go through. The pan being filled with water prevents ants from getting at the worms. No one who has not seen the destruction which ants can do would believe it. A few ants on a tray will kill thousands of worms in a very short space of time. They do not kill one and take it away and come back for another, but they go about and bite a lot of them one after the other, and in this way narcotize them, possibly with the intention of carrying them away at their leisure. The first effect of the injury done by an ant to a worm appears to be similar to that of a snake bite on larger animals. It may be of the same nature with that of the sting of the wasp on the caterpillar, the grasshopper, the cricket &c., when the wasp stores these insects up in the nest of its young.

A set of the above described trays is called a "Phandan," and for all ordinary purposes is very good. The only fault I find with the trays is that they are a little too large, and the distances between them too small, both of which can be easily remedied. The advantage of keeping worms in this way is that a great deal of surface is not taken up.

The way in which in Bengal the worms are changed on to a clean tray, when large numbers are reared, is the following:—the surface leaves with the worms on them are gathered with both hands and placed in a heap until they are all gathered off the tray. The tray is then cleaned, and the heap of leaves and worms is again spread out on the tray. This is a very unsatisfactory mode, the worms are very roughly handled and get knocked about too much. I do not refer to it as a system at all to be imitated, but unless the men who have the management of the worms are not well looked after they become careless.

What is very much wanted in silkworm rearing is some easy means of changing the worms from one tray to another, when it is required to remove the old leaves for the purpose of cleaning the trays. By such means the often handling of the worms would be entirely avoided, and the labor immensely facilitated.

Mr. Meakin on one occasion suggested to me that, if a net of the size of the tray with meshes not larger than is sufficient to allow the worms to go through them easily, were placed over the worms and fresh leaves strewn over the net, the worms would easily creep through it to the new leaves, after which, the net with old leaves and worms could be lifted on to a clean tray, leaving all their dung and dry leaves behind. This mode, barring the expense of making the nets, appears easy and practicable. This operation could be performed each time the worms were fed. I have not however had sufficient leisure to get some nets made in order to try how the suggestion would answer in practice. It would require two nets to each tray, because one net could not be removed from under the worms without handling them, until another net with fresh leaves on it be placed over them.

The two kinds of silkworms with which I have experimented without any doubt of success are the "Cheena" and the "Boro Pooloo," both of Bengal; the former, a monthly one, according to my experience, can only be reared in Oudh in June, July, August and September, (in October the "Choto Pooloo" of Bengal may perhaps be reared, but I have not tried it yet during that month) and the latter, an annual, can be easily reared in February and March.

In Oudh, in the months of November, December, and January, on account of the cold and absence of leaves, and in April and May, on account of the dry heat, no silkworms can be reared with advantage on a large scale. But if the proper temperature can be maintained, small quantities can be reared for the purpose of keeping up the stock. It is singular that the Bengalee reeler in putting by cocoons for eggs, selected those which had little silk in them. While I was trying to persuade him that the better the cocoons, the healthier would be the offspring of the moths, he naïvely remarked that the good cocoons had better be reeled, as they would produce a good deal of silk, while the others being less full of silk, may be used for

propagation. This appears to be the practice of the Bengal silkworm rearers, that is, they select the wrong way.

Dr. Forbes Watson has sent me from Lyons 1000 young plants of the variety of mulberry called "*Morus alba Italica*." In France it has been found the most useful kind for feeding silkworms. I was advised of their despatch from Marseilles, overland, by the steamer of the 28th February.

Dr. Forbes Watson writes as follows: "The person from whom I have obtained the plants in Lyons guarantees that 80 per cent will reach you in good condition, if they do in three months of leaving Marseilles, and should the present enterprize be successful, I no difficulty in supplying you and others interested in the matter with almost any quantity. I may mention that during the past two years upwards of five hundred thousand young mulberry trees have been sent from Lyons to China, Egypt, Mexico, and other parts. Regarding the treatment of the trees on their arrival in case they should have become dried up, the following directions have been forwarded for transmission. I transcribe them nearly received."

—"When the mulberry trees arrive at their destination, if they are dry, you must soak them in pure river or spring water for three hours. Whilst the trees are soaking, dig a hole nine inches deep in a good soil in the shade, and water it before putting the plants in, which you will do by laying them in the form of a mattress, (sic) of three inches thick, which you will afterwards cover with three inches of soil, and that again with other three inches of straw dung. Water should be thrown over the dung three times a day. The plants to remain in the above state for 3 or 4 days by which time it is expected they will have recovered their natural state, a point which must be ascertained by an occasional examination of their condition, because as soon as they recover themselves, they should be planted out, and afterwards well watered for the first few days. It is added this system may be applied with success to any plant in a dried up state that is not quite dead."—

The box of plants reached me on the 2nd May. On opening it, the young plants, each of which had a root, appeared rotten, giving off an offensive smell. However I followed the directions and planted them out. Many of them dried up, but some at this moment, (6th June,) although they have

not budded and don't appear very happy, do not seem to be lifeless. Something may come from them yet. *

From the few experiments that I have made, I am not in possession of sufficient data to enable me to state whether silkworm rearing in Oudh can be made a paying concern. The conclusions I have been able to come to from the experiments I have so far made, are the following :

1st.—The China silkworm can be reared, with ease, from middle of June to end of September.

2nd.—The "Boro Pooloo" worm of Bengal can be reared easily in February and March.

If in Europe it is profitable to rear silkworms *once* in the year, certainly ought to pay to rear them in Oudh, for besides the annual crop of the "Boro Pooloo" *three or four more* crops can be had between June and September from the China worm, without taking into consideration the possibility of also rearing the Cashmere and Bokhara worms ; but as in every thing else, proper arrangements must be made, the principal of which are the following:

1st.—A proper rearing house furnished with every thing that is necessary to regulate the temperature, and to rear the worms is indispensable. (I understand from Mr. Meakin that in France, for the purpose of changing the worms from one tray to another they use perforated paper of different sizes to suit the age of the worms. Some such implement is indispensable.)

2nd.—The rearing house is to be situated in the midst of a plantation, which is to be of a size adapted to the number of worms to be reared. The proportional size of plantation to number of worms, and the mode of constructing the rearing house &c. &c. can be obtained from Europe.

3rd.—The kind of mulberry that I would prefer for feeding silkworms on a large scale is what is called by natives the "Dasee Shahtoot." This kind naturally grows into a lofty tree, but on a plantation it ought to be kept down.

* None of them came to anything. If they had reached me in the cold weather the result might have been favorable.

What is called the "Habshee Shahtoot" is also a very useful kind. It is naturally low and wide-spreading. With regard to the "*Morus multicaulis*," the one used in Bengal, I cannot say much. It requires plenty of water to grow luxuriantly and may be useful at some seasons. It is the one which can be propagated with most ease and rapidity. The "*Morus cucullata*" is only of use when the worms are in their first stages, otherwise I would not use it.

Let it not be forgotten that whatever kind of plant is used, for the first two or three years it will require watering, especially during the hot winds. Whatever the case may be in other provinces, no young plant will live during the hot winds, without being watered.* It is different when the plant is sufficiently grown, and has sent its roots sufficiently deeply to be independent of surface moisture.

4th.—The dry leaves and dung of the worms will be profitably used as manure for the mulberry trees.

5th.—The reellers should be good ones, and the silk reeled for the home market.

6th.—As a great number of workmen would be required, if silkworms are reared for commercial purposes, it would be difficult to find work for them, during the first part of the winter, and during the hot months when no rearing can take place, so that some other crops might also be grown to keep the men employed during the intermediate seasons. I find that new Orleans cotton will exactly provide the requisite occupation. It gives two crops in the year. The rain crop begins to ripen about October when the breeding of the China worm stops, and the summer crop of cotton begins to ripen in May, soon after the breeding of the "Boro Pooloo" worm comes to an end. The picking and ginning of cotton during the two periods in which the worms cannot be reared, will sufficiently occupy the laborer's time; Otherwise it will be found inconvenient to dismiss the workmen periodically,

* I was very agreeably astonished at the end of the severe hot weather of 1864, when I went to see a plot of ground which was planted with young native mulberries (*Dasee*). These had been planted during the rain of the previous year, and there having been no possibility of watering them, I expected to find them all dead at the end of the hot weather from want of water, but to my great delight, scarcely one of them was dead, and about 90 per cent were covered with green leaves. The case would be quite different with many of the other kinds of mulberry trees in their young stage.

when not required. They will take service at some other place and new hands will have to be employed each time they are wanted. I merely mention cotton as a suggestion. Its cultivation in Oudh is not sufficiently established, but I have not much doubt that in course of time it will be extensively grown. Lastly, silkworm operations are most likely to pay not on land situated in the vicinity of cities but on land which is now being cleared. In the vicinity of cities, I think it will always be found more profitable to produce food for man.



